

---

# The Experimental Laser Ranging System for Space Debris at Shanghai

Yang Fumin<sup>1</sup>, Chen Wanzhen<sup>1</sup>, Zhang Zhongping<sup>1</sup>, Chen Juping<sup>1</sup>, Wang Yuanming<sup>1</sup>,  
K. Hamal<sup>2</sup>, I. Prochazka<sup>2</sup>

1. Shanghai Astronomical Observatory, Chinese Academy of Sciences
2. Czech Technical University in Prague, Czech Republic

## Abstract

*The paper introduces the performance of the experimental laser ranging system for space debris at the Shanghai Observatory. The output of laser is 2J in 532nm, 10ns, 20Hz, 40W. A new transmitting telescope with the aperture of 210mm is used, and the other parts of the ranging system are the same with the routine SLR system in Shanghai. The ranging system is under testing now.*

## Introduction

China has launched many spacecrafts into space and had produced many space debris during 30 years. China is one of the members of IADC (Inter-Agency Space Debris Coordination Committee). It is necessary for China to pay great attention to reduce damages from space debris in cooperation with international community. The project of laser ranging to space debris at Shanghai Astronomical Observatory is supported by the Chinese Space Agency. An experimental laser ranging system for space debris at Shanghai is set up in 2006. The goals of the project are as follows: 1) Development of the technology for space debris laser tracking. 2) Experimental observations and orbit determinations for space debris, not routine observations.

## 2. Performance of the system

The major parts of the space debris ranging system are the same with the SLR system at Shanghai. A China-made 40W Q-switched Nd:YAG laser has been installed and is located at the neighbor room to the mode-locked laser for SLR. There are ten Nd:YAG rods in the laser with the output of 2J in 532nm, 10ns width, 20Hz repetition, 0.6mrad divergence. A new transmitting telescope with 210 mm aperture was installed and replaced the old one with 150mm aperture for better collimating beam. The testing of laser ranging to the satellites with retro-reflectors has been done. The next step will try to ranging to uncooperative space targets soon.

Some photos for the system are shown as follows.



*Fig.1. The Optical Observation Site at Shanghai Observatory, CHINA*



*Fig.2. SLR House in Shanghai*



*Fig.3. SLR Telescope(Aperture 600mm)*



*Fig.4. Electronics Room*



*Fig.5. High Power Laser & Power Supply, Chiller*



*Fig.6. Output of High Power Laser*



*Fig.7. Inside of the 40W Pulsed Nd:YAG Laser*



*Fig.8. Coupling Optics*



*Fig.9. Laser Firing (2J, 20Hz, 40W in 532nm)*



*Fig.10. Laser Firing*